

*al* and *Sanders*.

Claims 13 to 17 follow Claims 50 to 54 of Application Serial No. 09/314,529. Claim 13 includes a reversible electric motor connected to the door lift devices operable at a constant rate of speed for operating the door lift devices. A reversible electric motor was not specifically claimed in Claim 50 of Application Serial No. 09/314,529.

The prior art structures for opening and closing bi-fold doors in the past 60 years used electric motor driven winches accommodating cables for connecting the doors to the winches. Examples of these cable winches for opening and closing bi-fold doors as disclosed in the following patents:

U.S. Patent No. 2,274,276	<i>Sanders</i>	1942
U.S. Patent No. 3,155,147	<i>Smith</i>	1964
U.S. Patent No. 4,088,172	<i>Pollach</i>	1978
U.S. Patent No. 4,545,418	<i>List et al</i>	1985
U.S. Patent No. 4,609,027	<i>Keller</i>	1986
U.S. Patent No. 5,168,914	<i>Keller</i>	1992
U.S. Patent No. 5,343,923	<i>Keller</i>	1994

The winches have wire cables, such as aircraft cable and cylindrical drums which are rotated with electric motors to wind and unwind the cables on and off the drums. The drums have uniform outer cylindrical surfaces which accommodate cables along the length of the drums. The bi-fold door opening and closing episodes occur at constant speeds determined by the speed of rotation of the drums. The wire cables require periodic adjustments and maintenance. They are subject to wear which reduces their working life. There was a long felt need to improve the bi-fold door opening and closing devices and overcome the disadvantages of the winches having cables.

Applicant has invented a new and novel method and apparatus for moving a bi-fold door between open and closed positions. The apparatus has door lift devices having elongated flat flexible webs having a first end connected to a shaft and a second end connected to an anchor. A reversible electric motor operating at a constant speed selectively rotates the shaft in opposite directions to wind and unwind the webs of all the lift devices on and off the shaft. The webs are wound in overlapping relation so that when the door is opened the rate of speed of the opening of the door increases as the diameter of the overlapping web increases. When the door is moving to the closed position the rate of speed of the closing door decreases as the diameter of the overlapped web decreases. The change in speeds of the opening and closing of the door is achieved with the shaft turning at a constant rate of speed. In use, the webs are strong, require less maintenance than prior wire cables, last longer than cables and substantially reduce noise when the bi-fold door is opened and closed. Prior bi-fold doors do not use door lift devices having flexible webs and do not open the door at an increasing rate of speed and close the door at a decreasing rate of speed. Applicant's method of opening and closing a bi-fold door moves the panels of the door at an increasing rate of speed from a closed position to an open position and moves the panels at a decreasing rate of speed from an open position to a closed position.

Applicant's method and apparatus for opening and closing a bi-fold door as claimed in this application has achieved commercial success. Sales of bi-fold doors having the claimed webs and method of opening and closing the doors since 1999 are about 725 doors having a dollar volume of about \$4,195,000.

Enclosed are Applicant's assignee's brochures, Schweiss Bi-Fold Doors "Lift Straps" (Exhibit A), Special Design "Lift Straps" (Exhibit B) and web page "Lift Strap" by Schweiss (Exhibit C). The brochures and web page are used in the marketplace to apprise consumers of the structure and features of Applicant's door opening and closing device. Brochure (Exhibit A)

contains the following description:

The "New Lift Straps" . . . increase the opening and closing speed of your Bi-Fold Doors. . . . wrap on top of themselves -- increasing the size of the lift drum which makes your Bi-Fold Door open and close faster.

Brochure (Exhibit B) explains how the new "Lift Strap" works.

The strap wraps around the lift drum as the door opens, increasing the size of the drum. The larger the drum's circumference the faster the door opens. It's ideal: the door opens slowly at first and quickly picks up speed, a nice safety feature.

The back of this brochure compares straps versus cables. Relative to speed, the following statement is present.

Straps will increase the opening/closing speed of the door due to the size of the drum circumference. The door is opened slowly at first then speeds up, a good safety feature.

The web page (Exhibit C) contains the following statement.

The "New Lift Straps" . . .

- increase the opening and closing speed of your Bi-Fold Doors.
- wrap on top of themselves -- increasing the size of the lift drum which makes your Bi-Fold Door open and close faster.

These brochures and web page emphasize the novel and claimed method and apparatus for opening and closing a bi-fold door. The commercial importance of the claimed method and apparatus is evidenced by the brochures, web page, and volume of sales of Applicant's bi-fold door opening and closing device.

Claims 1 to 14 and 18 to 20 define Applicant's method of opening a door movable between a down closed position and an up open position. The door moves at an increasing rate of speed from the closed position to the open position in response to rotation of a rotatable member which is rotated at a constant rate of speed in one direction. The door moves at a decreasing rate of speed from the open position to the closed position during rotation of the rotatable member at a constant rate of speed in a direction opposite the one direction.

Claims 3 to 5 and 9 to 11 are dependant claims that further define the changing speeds of the door during its opening and closing. These speeds change during the entire movements of the door.

Claims 12 and 18 include the method using an elongated flexible web which wind in overlapping relationship around a rotatable member. The winding of the web in overlapping relation around the rotatable member increases the opening speed of the door. The unwinding of the web from overlapping relation around the rotatable member decreases the closing speed of the door.

Claim 13 defines Applicant's bi-fold door and apparatus for moving the bi-fold door between open and closed positions. The apparatus has door lift devices having elongated flat flexible webs having a first end connected to a shaft and a second end connected to an anchor. A power means selectively rotates the shaft in opposite directions to wind and unwind the webs of all the lift devices on and off the shaft. The webs are wound in overlapping relation so that when the door is opened the rate of speed of the opening of the door increases as the diameter of the overlapping web increases. When the door is moving to the closed position the rate of speed of the closing of the door decreases as the diameter of the overlapping web decreases. The change in speeds of the opening and closing of the door is achieved with the shaft turning a constant rate of speed. In use, the webs are strong, require less maintenance than prior wire cables and substantially reduce noise when the bi-fold door is opened and closed. Prior bi-fold doors do not use door lift devices having flexible webs as defined in Claim 13.

Claims 14 to 17 depend on Claim 13. Claim 14 further defines the web. Claims 15 and 16 define the plates secured to the shaft and the connection of the web to the plates to confine the web to its overlapping relation around the shaft during winding and unwinding of the web around the shaft. Claim 16 includes a cylindrical shield surrounding the plates and the web wound

around the shaft. Claim 17 defines the means to adjust the working lengths of the webs so that all the webs work together to open and close the bi-fold door. These claims more particularly define parent Claim 13.

Reconsideration of the rejection of the claims under 35 U.S.C. 103(a) as unpatentable over *Keller '914* in view of *Ballyns et al* or *Horn*.

The test for determining obviousness of a claimed invention under 35 U.S.C. 103 is a four-part inquiry comprising (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the pertinent art; and (4) commercial considerations when such evidence is present. *Graham v. John Deere Co.*, 383 U.S. 1 (1966); *Simmons Fastener Corp. v. Illinois Tool Works*, 222 U.S.P.Q. 744 (Fed. Cir. 1984).

*Keller '914* discloses a conventional prior bi-fold door as described in the Background of the Invention and the prior art for the past 60 years. The *Keller '914* door and lift device, shown in Figure 8, comprising a motor 40, winch 46 and cable 48 wound on winch 46. Winch 46 has a cylindrical drum having a uniform diameter. Cable 48 winds and unwinds along the length of the drum. The opening and closing of the door episodes occur at a constant speed determined by the speed of rotation of the winch drum. In other words, the speed of opening of the door does not increase as the door opens. Also, the speed of closing the door does not decrease as the door closes. The total time for opening and closing the door is more than the total time for opening and closing Applicant's bi-fold door. Applicant's shorter door opening and closing time saves power and heat energy loss from the structure equipped with Applicant's bi-fold door and lift apparatus. The cables require periodic adjustments and maintenance and are subject to wear. Applicant's web is not the mechanical equivalent to the prior art cables in lift devices for bi-fold doors.

*Ballyns et al* discloses a winch mechanism 16 that includes a reversible motor 40 for driving a shaft 44. A pair of spools 46 are secured to opposite ends of shaft 44. A second spool 48 is connected to shaft 44 through a clutch mechanism 46. Clutch mechanism 46 is designed to permit spool 48 to slip as required in use to accommodate differences between the rate of winding on spools 46 and play out on spool 48. Spools 46 are connected with first strap members 70 to the lower panel of a roll-up door. A second strap member connects the spool 48 to the upper edge of the uppermost door panel. The one-way clutch mechanism 54 allows spool 46 and shaft 44 to free wheel during closing of the door and spool 48 to free wheel during opening of the door. The speed of opening the door increases during the opening movement and the speed of closing the door increases during the closing movement of the door. The same spools and strap members are not used to open and close the door. *Ballyns et al* does not disclose nor suggest the use of a single rotatable member accommodating a flexible strap to both increase the speed of opening a bi-fold door and decrease the speed of closing a bi-fold door.

*Horn* discloses a roll-up door movable to open and closed positions with a conventional garage door opener. Door 20 is counterbalanced with a coil torsion spring 82 mounted around shaft 84. Spindles 86 secured to shaft 84 accommodate cables 90 which are connected to the bottom panel of door 20. Cables 90 are tension members used by spring 82 to counterbalance the weight of the door. The tension members are disclosed as cables. The specification states that other forms of tension members 90 may alternatively be used including, for example, cords, ropes, belts, chains, and the like. *Col. 4, lines 46-50*. The tension members are not used to open and close the roll-up door. There is no teaching or suggestion by *Horn* of using an elongated flexible web wound on a rotatable member to increase the speed of opening a bi-fold door and being unwound from the rotatable member to decrease the speed of closing the bi-fold door.

It is submitted that one skilled in the art of devices for opening and closing bi-fold doors

would not use elongated flexible webs with rotatable members driven at a constant speed to increase the opening movement of a bi-fold door and to decrease the closing movement of the bi-fold door in view of the teachings of *Keller '914*, *Ballyns et al* or *Horn*. Winches having cables to open and close bi-fold doors have been in use for at least 60 years. During this long period of time no one used webs as defined by the claims in bi-fold door opening and closing devices. Applicant's claimed method and apparatus satisfied a long felt need to overcome disadvantages of the winches having cables in door opening devices. Applicant's claimed method and apparatus has achieved considerable commercial success in a relatively short period of time. This success is predicated on the novel claimed method and apparatus and functions. *Ballyns et al* uses webs and drums with a clutch mechanism to increase the speed of both opening and closing movements of the door. *Horn* does not use cables or webs to control opening and closing movements of the door. In view of these facts it is submitted that Applicant's method Claims 1 to 12 and 18 to 20 and apparatus Claims 13 to 17 are allowable. Allowance of these claims is requested.

Claim 15 depends on Claim 13. This claim further defines the means connecting the first end of the web to the rotatable means. Plates are secured to the shaft. A rigid member extends between and is mounted on the plates. The web is connected to the rigid member. This structure is not present in *Spangle*. *Spangle* discloses a belt reel rotatably mounted on a spindle C, shown as a stationary cylindrical member. Reel D is rotatably mounted on the spindle. Reel D has a hub I with outwardly directed arms. Pin or rod E mounted on opposite arms provides a connection for the free end of the belt. Reel D is turned with handle G to wind the belt on the reel. Reel D is not secured to spindle C and does not turn with spindle C. There are no plates secured to a rotatable shaft disclosed by *Spangle*. Claim 15 defines a web connection to a rotatable shaft that is not suggested by *Spangle*. The allowance of Claim 15 is requested.

Claim 16 defines a shield having a slot and a web extended through the slot. *Meurer* is cited to show retainer straps 66 and 67 partly around reels accommodating tapes 37 and 38 to prevent the tapes from expanding and become uncoiled. As shown in Figure 6, the opposite ends of straps 67 are secured to a base plate 76. Straps 66 and 67 do not have slots and tapes that extend through the slots. Applicant's shield with a slot from the web maintains alignment of the web as it winds and unwinds from the rotatable member. This function is not present in *Meurer*. Allowance of Claim 16 is requested.

*Sanders* in 1942 discloses the conventional winch and cable device for opening and closing a bi-fold door. As shown in Figures 1 and 2, cables 17 are connected to eye bolts 24 adjustably attached to brackets 25 on the back of the lower panel of the door. There is no showing of a web and means to adjust the working length of the web to allow the door to move to the full open and closed positions as defined in Claim 17.

In view of the above remarks, Applicant requests the allowance of Claims 1 to 20.

Respectfully submitted,

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Richard O. Bartz  
Signature

November 1, 2001  
Date of Signature



A1  
12. The method of Claim 7 wherein: the rotatable member is connected to the door with an elongated flexible web which winds in overlapping relation around the rotatable member.

A2  
18. A method of opening and closing an opening in a structure with a bi-fold door having hinged panels, means movably mounting the door on the structure for movement between a down closed position to an up open position, and a door lift device having a rotatable member operable to selectively move the door between the closed and open positions thereof comprising: connecting the rotatable member to one panel of the bi-fold door with an elongated flexible web which winds in overlapping relation around the rotatable member, rotating the rotatable member at a constant rate of speed, moving the door at an increasing rate of speed from the closed position to the open position during rotation of the rotatable member at a constant rate of speed and winding the web in overlapping relation around the rotatable member in one direction, and moving the door at a decreasing rate of speed from the open position to the closed position during rotation of the rotatable member at a constant rate of speed and unwinding the web from overlapping relation around the rotatable member in a direction opposite the one direction.

19. The method of Claim 18 including: operating a reversible electric motor at a constant rate of speed to rotate the rotatable member at a constant rate of speed.

20. The method of Claim 18 wherein: the door is moved at an increasing rate of speed during the entire movement of the door from the closed to the open positions thereof, and the door is moved at a decreasing rate of speed during the entire movement of the door from the open to the closed positions thereof.